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As for the possibility of detecting the existence of electric fields in the Sun by means of the Stark effect, the existing evidence appears to be negative. In view of the powerful magnetic fields in sun-spots, it seems probable that electric fields of considerable intensity may also be found there. I have examined our photographs of spot spectra with the object of detecting any anomalies ascribable to the Stark effect, but so far without success. Comparatively few of these photographs, however, were taken for the study of plane polarization effects, and in these cases the spots observed were at some distance from the center of the Sun. It will be necessary to repeat the observations with special polarization apparatus in the case of sun-spots lying near the Sun's center and elsewhere, and also to extend them to the chromosphere, with special reference to its lower levels. At present it can only be said that if the Stark effect exists in the Sun its magnitude appears to be so small that special methods, similar to those employed in the study of the general magnetic field, will be required to detect it. Polarizing apparatus suitable for this purpose is described in a paper read before the American Philosophical Society on April 24th.[1] GEORGE E. HALE.

PRELIMINARY NOTE ON THE DISSYMMETRY OF LINES IN THE SPECTRUM OF THE CONDENSED SPARK.

That the strongly condensed spark gives spectrum lines which in general are stronger on the red side is well known. It is difficult to make accurate micrometer settings on such lines, so that spark spectra to be measured are usually obtained with considerable inductance in the circuit, which sharpens the lines and at the same time reduces the tendency toward dissymmetry. As the effect is not easily measured by our usual methods and can be minimized when desired, it has not taken its place as an active agency in the displacing of lines. When a displacement is observed, the probable influences of pressure and of motion in the line of sight are first considered. The condition is to be faced, however, that a source giving strong enhanced lines must bear a certain resemblance to the vapor in the interior of the condensed spark and that a similar displacing influence is to be expected.

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[1] Soon after the appearance in *Nature* of the first announcement of his discovery, I wrote to Professor STARK regarding the determination of the effect for the lines of iron, chromium and other metals found at low levels in sun-spots and the solar atmosphere, where intense electric fields may exist. He replied that the absence of series lines in their spectra had led him to omit them from his preliminary program, but that he would endeavor to observe the effect for these elements during the coming summer.

Recent tests of the registering micro-photometer, designed by Professor KOCH, which were reported in part in the *Astrophysical Journal,* **39,** 213, 1914, showed that the position of maximum density could be determined, even for lines of very diffuse appearance, by means of the intensity curves which this instrument registers. In order to study the qualitative aspect of the effect and determine the proper conditions for the taking of photographs to be used in the micro-photometer, I have made a number of plates for selected regions of the iron and titanium spark spectra, using a powerful transformer discharge with large capacity and only the small inductance given by the leads. Arc spectra on the same plates showed the structure of the lines in this source. The scale of the plates was about $1^{mm} = 0.9$Å.

The effect of such a spark on those lines which are strong and easily reversed in the arc is very decided. While in the arc these lines are symmetrical, in the spark the red side is usually much stronger. If reversed, the spark gives the reversal much to the violet of the center of the line. Furthermore, this reversal coincides with the position of the arc line, as was shown by photographing the arc spectrum adjacent to that of the spark. Some lines in the blue and violet are given by the spark with the red side fully twice as strong as the violet side, while in the arc the two sides of the reversal are of equal length. That this condition is caused by the interior of the spark giving a line displaced toward the red is well shown when a horizontal cross-section of the spark is projected on the slit of the plane-grating spectrograph. The long line thus produced is strongly unsymmetrical in the middle of its length, where the chief radiation is from the center of the spark, but changes gradually into symmetry toward the ends, showing that the outer vapors of the spark give a line of the same wavelength as the arc.

Iron lines, when of the same character, show this dissymmetry much more uniformly than do those of titanium. The latter element shows most of its stronger arc lines decidedly unsymmetrical in the spark, but some of them remain nearly symmetrical. In addition to these exceptional cases, two important groups of lines show little response to the displacing action of the spark discharge. They are the enhanced lines and the "flame" lines, the latter being strong at low temperature in the electric furnace. These two classes form the extremes of the excitation scale, the "flame" lines being emitted by the outer vapors of the spark and the enhanced lines almost solely by the core. Lines belonging to different groups in the furnace classification show varying degrees of dissymmetry in the spark.

In regard to the important question as to how this effect varies with the wave-length, the preliminary examination shows that the majority of the lines strongly affected lie toward the violet end of the spectrum. This may be closely connected, however, with the fact that the effects of widening and reversal in the arc and spark are more decided in the region of shorter wave-length. The character of the iron spectrum is such that the lines showing the strongest dissymmetry in the spark occur to the violet of λ 4400. With titanium, a strong group near λ 5000 shows the same variety of effects that appear among the blue and violet lines. In all regions the approximate symmetry of the "flame" and enhanced lines is in strong contrast with the appearance of many of the arc lines.

The evidence at present is against a close relation between the effect of the spark discharge and the pressure effect: first, because the spark dissymmetry shows no tendency to increase with the wave-length, but rather the reverse; second, lines of the same pressure displacement are often very different in their spark dissymmetry; third, the enhanced lines, usually strongly affected by pressure, show a minimum spark effect. The fact that some of the "flame" lines are but slightly displaced by pressure and remain symmetrical in the spark is the only point of resemblance between the two effects thus far noted.

The dissymmetries recently described by the writer for the lines of iron and titanium in the "tube-arc," which furnishes spark conditions *in vacuo* without the use of a high potential, correspond in all details, as far as the same regions of the spectrum have been examined, with those produced by the condensed spark. The varying dissymmetries of certain titanium arc lines and the symmetry of the enhanced lines were features noted in the "tube-arc" spectrum. The violently disruptive action of the spark discharge thus does not appear to be essential to the phenomenon.

The evidence at hand points to a real displacing action, highly selective in character, being exerted by the conditions in the interior of the spark. A fairly definite program may be offered for the study of this effect and its application to any spectrum in which the strength of enhanced lines indicate that displacements due to this cause may have a magnitude worth considering. The relative intensity of enhanced and arc lines in the spark spectrum may be controlled within a wide range by adjusting the circuit conditions. The function of the micro-photometer will be two-fold: first, to measure the relative strength of the enhanced and arc lines for a given condition by means of the areas of their intensity curves, lines of these two classes being often very different in appearance; and, second, to show for a given line in the spark spectrum where its maximum is located with reference to the position of the corresponding line in the arc, the latter being obtained either from an adjacent arc spectrum, or, in the case of reversed spark lines, from the position of the reversal. The tests already carried out with the micro-photometer brought from Munich by Professor KOCH have shown these measurements to be well within the capabilities of the instrument. A large apparatus of the same type is now under construction here for the work on the large-scale spectrograms. ARTHUR S. KING.

MOUNT WILSON SOLAR OBSERVATORY,
May 14, 1914.

BLINKSTERNE.

For several years Dr. HARTWIG, in the annual *Katalog und Ephemeriden veränderlicher Sterne*, has used the term "antalgol" to designate a small group of variable stars whose light curves are similar to those of the *Algol* variables when rotated thru 180° about the horizontal line, or turned upside down. Dr. HARTWIG has now given up the use of this term and in the